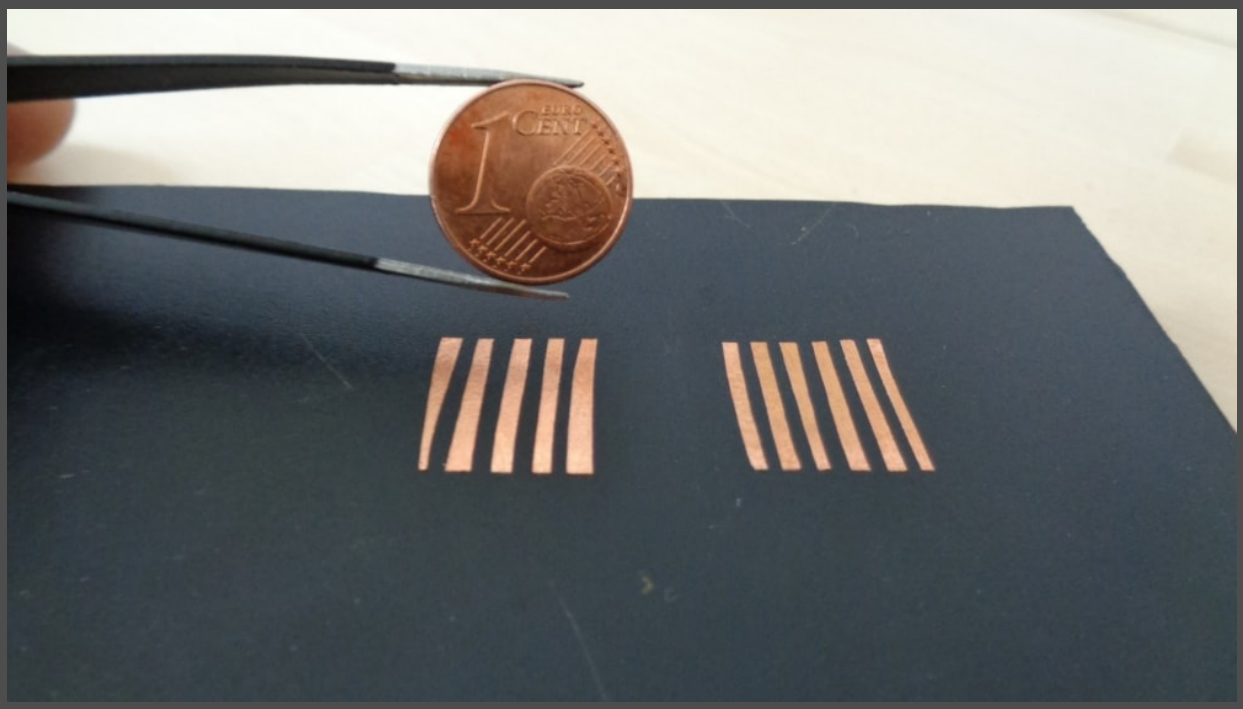
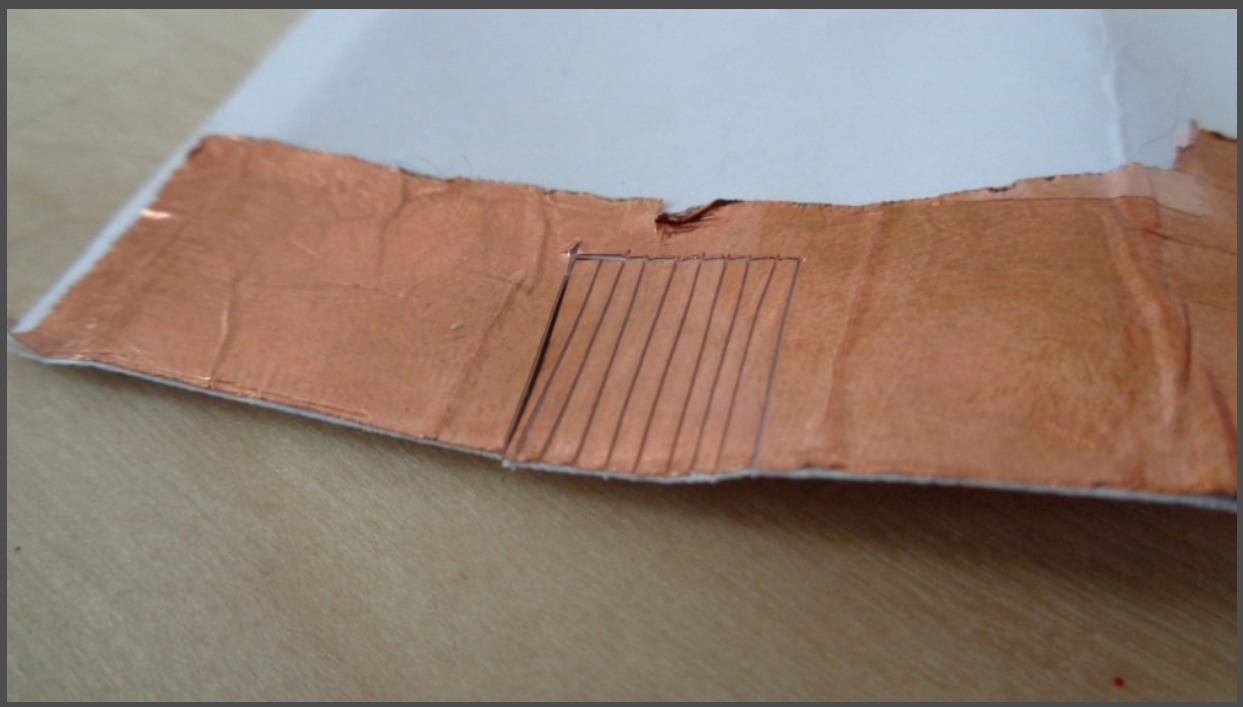


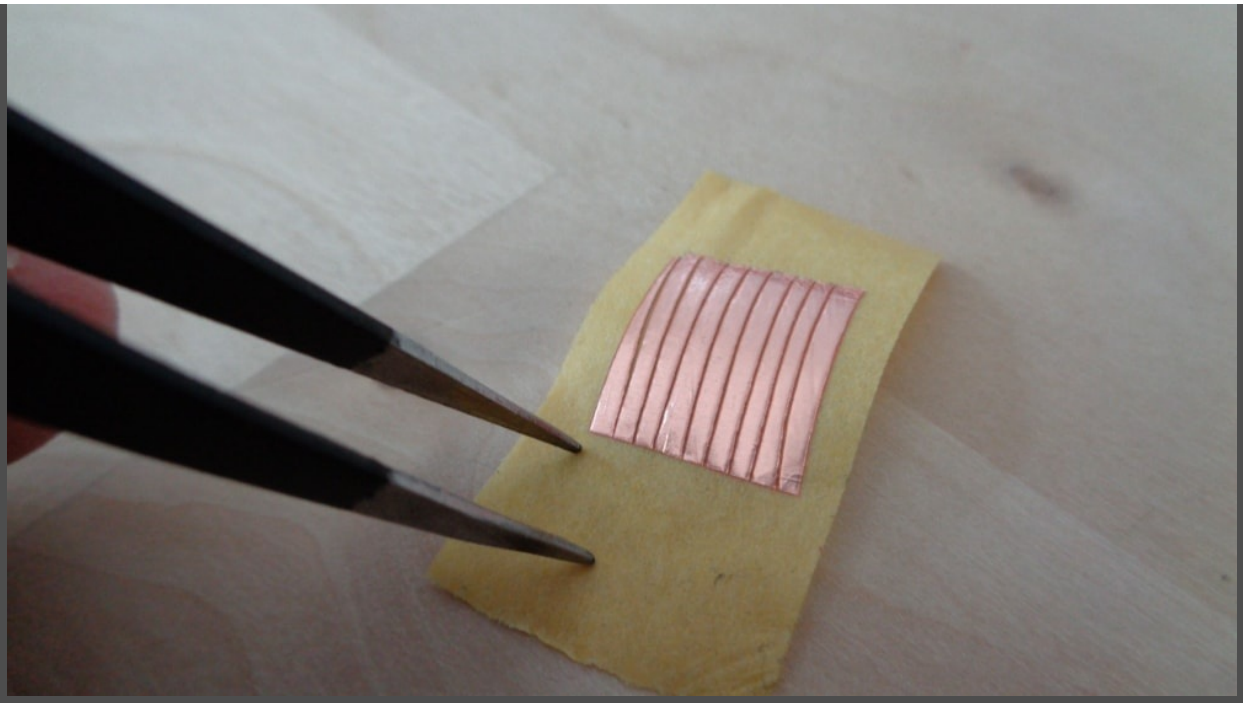
Copper Cut

Electronics / Science

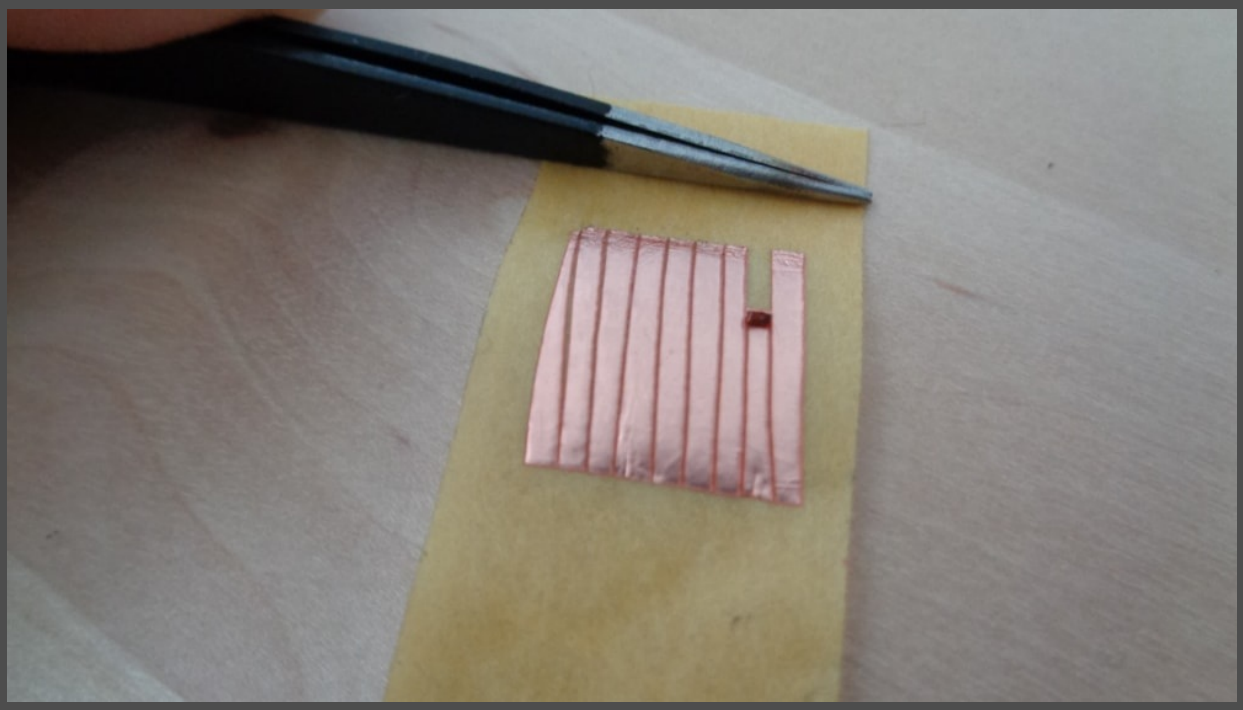
Since a good week I am at a project for which I have to glue copper foil adhesive tape on a plastic plate. Until then I had cut it all out by hand and then removed it from the base and glued it on. Unfortunately, this is cumbersome and unclean. Then I came across the Vinylcut Copper & Fabric PCB tutorial during my research on the Internet, which helped me a little further. They work with a plotter and everything is quite professional. So I had to come up with a technique that works well and with which you can also work on a smaller scale.



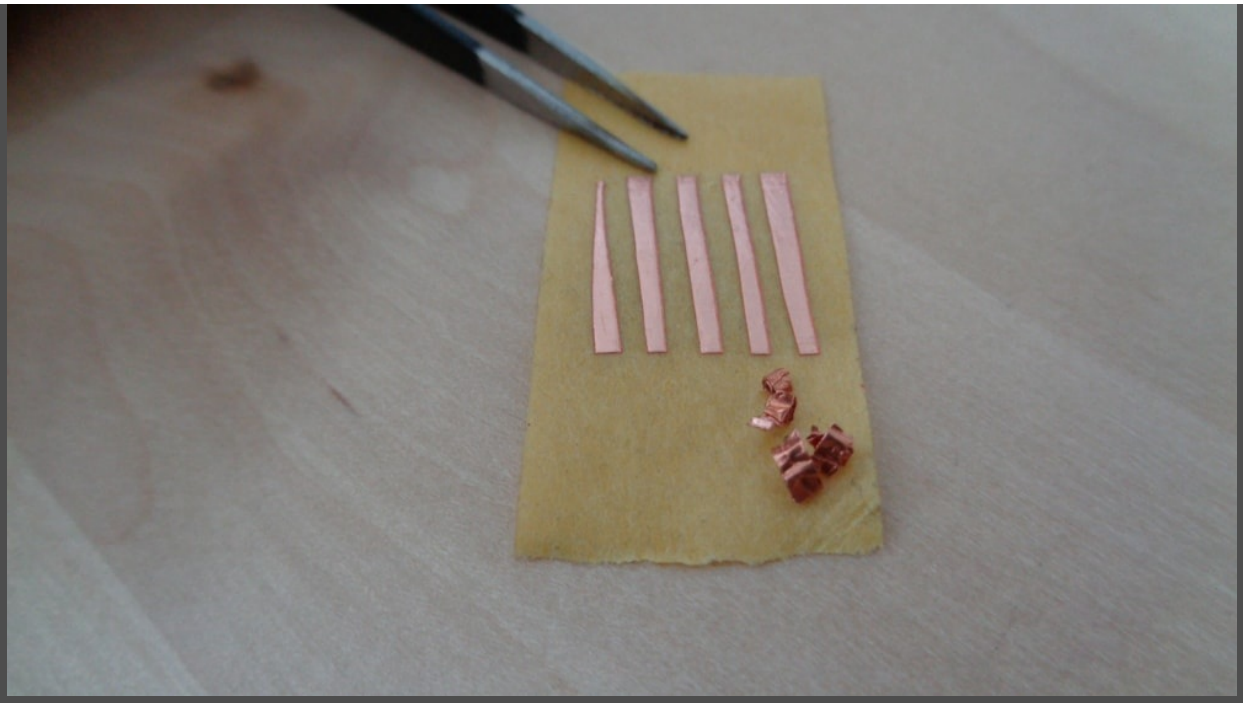
For the project it was not necessary to pay attention to straight lines, but rather to the actual size in the millimetre range. I think that's hard for a very good plotter to cut. In the first step, the required strips were pre-cut on the adhesive tape. Care was taken not to cut too deeply into the base of the copper foil adhesive tape.



Instead of a real transfer foil we use the making tape from Tamiya. We simply place the masking tape with the adhesive side on the non-adhesive side of the copper foil. With this we can remove the base (the white paper with coating was sticking a sticker). Both adhesive surfaces lie upwards. It is best to hold this with tweezers so that nothing sticks to your finger.



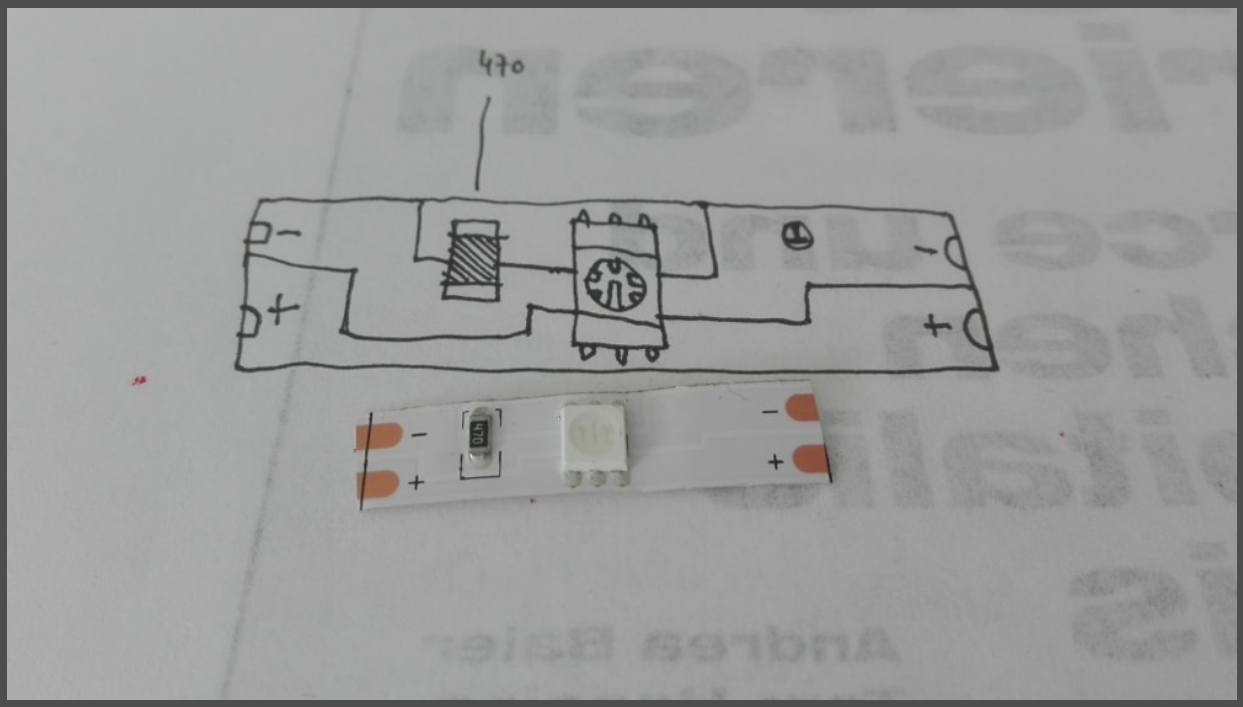
Now we hold the masking tape with the tweezers and can carefully scrape off the strips with a scalpel, which we do not want to have glued on. Since the copper foil is a little stronger and more stable, you can roll it up and simply remove it at the end with the tweezers. With a little practice you can draw and cut out whole traces, but you need a lot of patience.



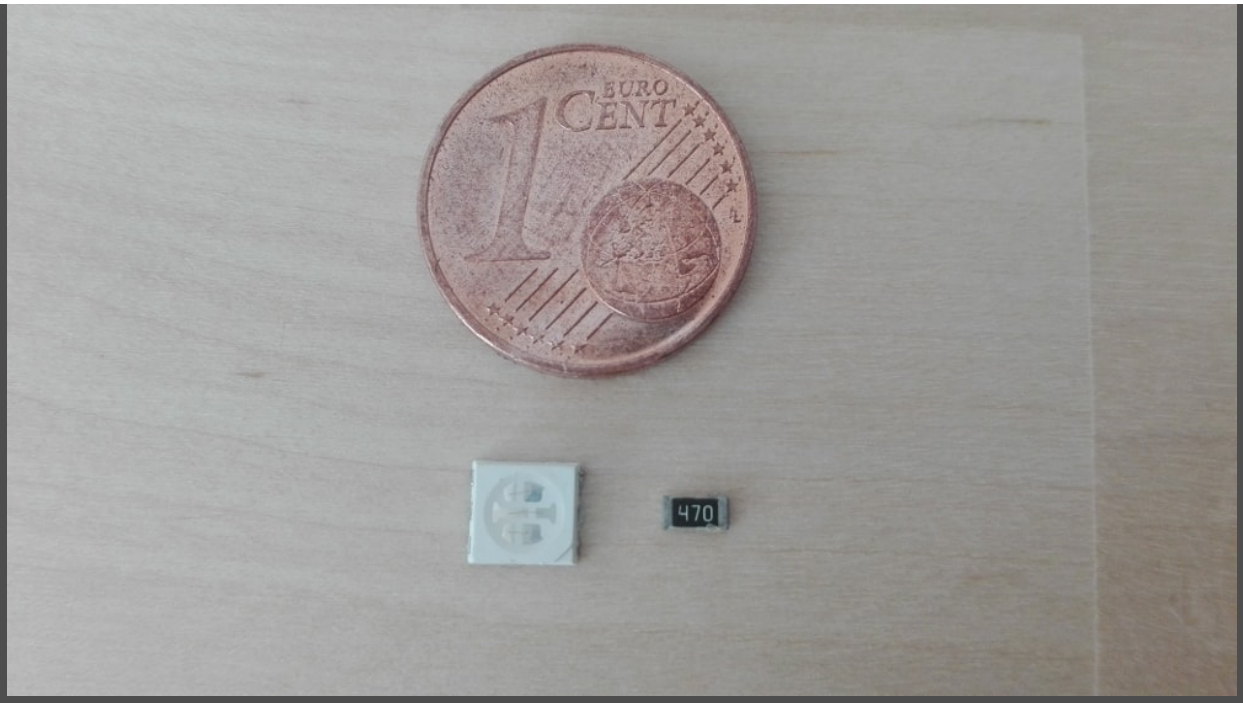
In the last step you can put the tape on a surface and glue it on. The copper foil must be pressed on with a solid object (without sharp edges). After that you can carefully remove the yellow masking tape and have the finished strips. At the top of the photo you can see the finished work of the experiment in contrast to a €0.01 coin. With a microscope it is probably possible to work even finer, for me this is enough so far and I don't need expensive equipment.

Reality check

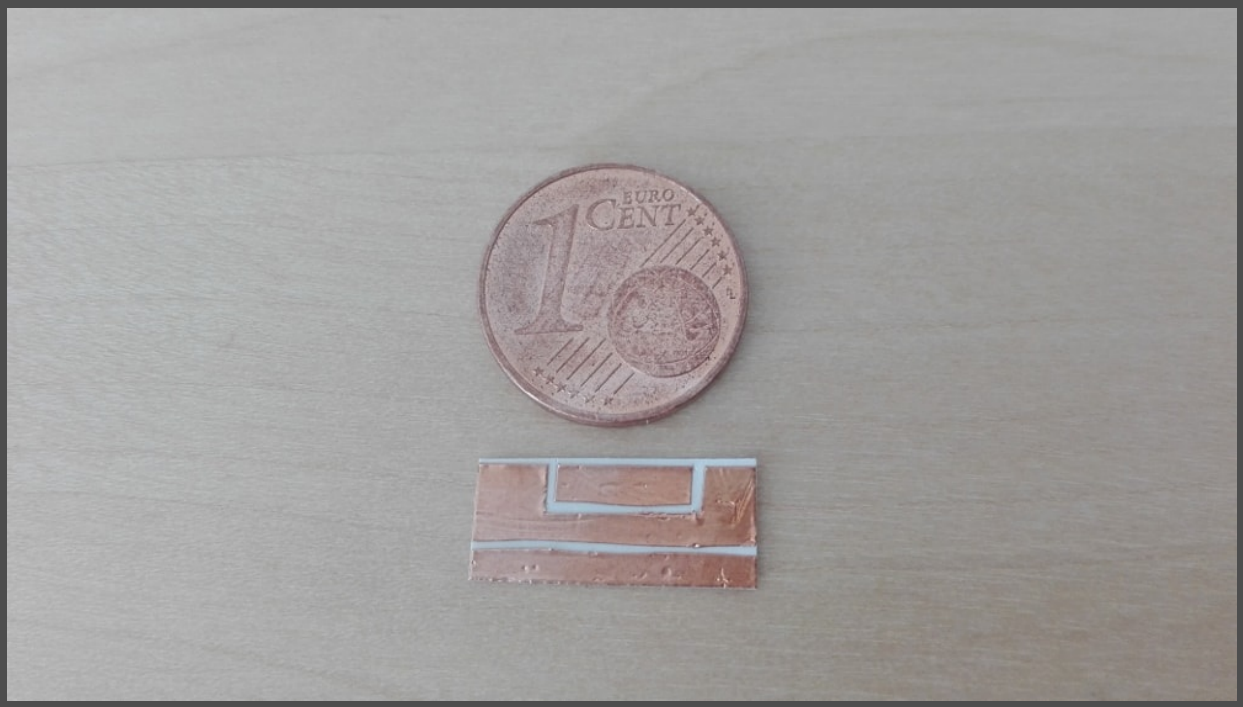
In order to see whether a technical procedure also works in reality, one must always implement a reality check. In web design you can fill all sample texts in a project with Lorem Ipsum, but they will not behave like real texts. They will only ever represent an idealized image. This also applies to the adhesion of the copper tape.



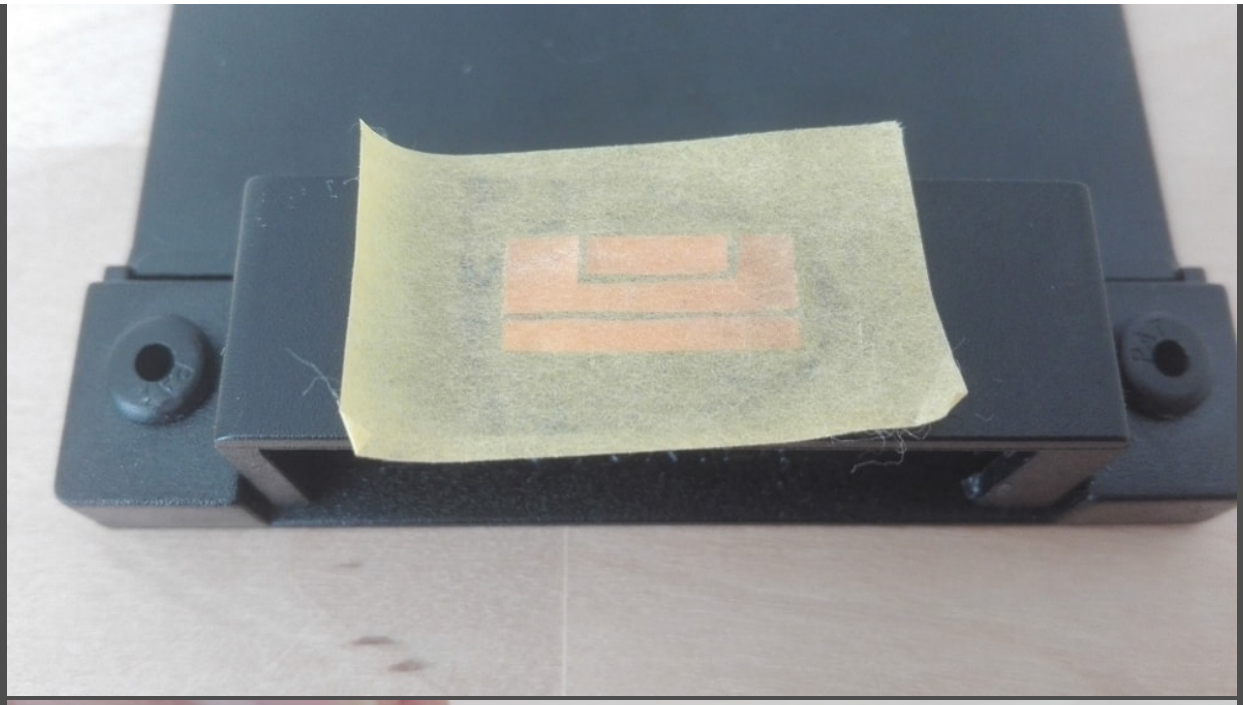
Since there is nothing better for me spontaneously, I simply took an LED strip as a model. I copied it and documented the individual steps. This is only a test and not a working mockup. It was only a matter of testing what to look out for and whether the gluing works well.

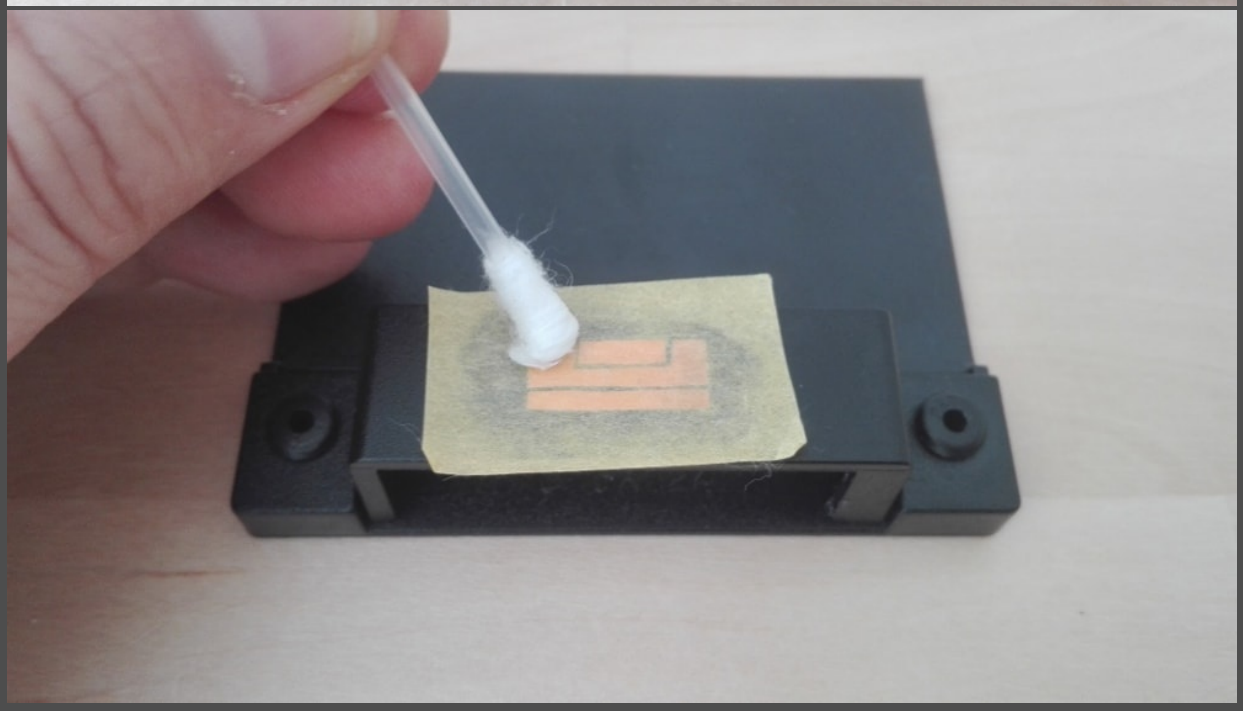


I desoldered the single LED and the SMD resistor with a hot air dryer. You have to be very careful so that the components don't fly away (it happened to me the first time) and don't hold the hair dryer too close to the plastic strip. But I can handle this technique better than the desoldering wire and a soldering iron.



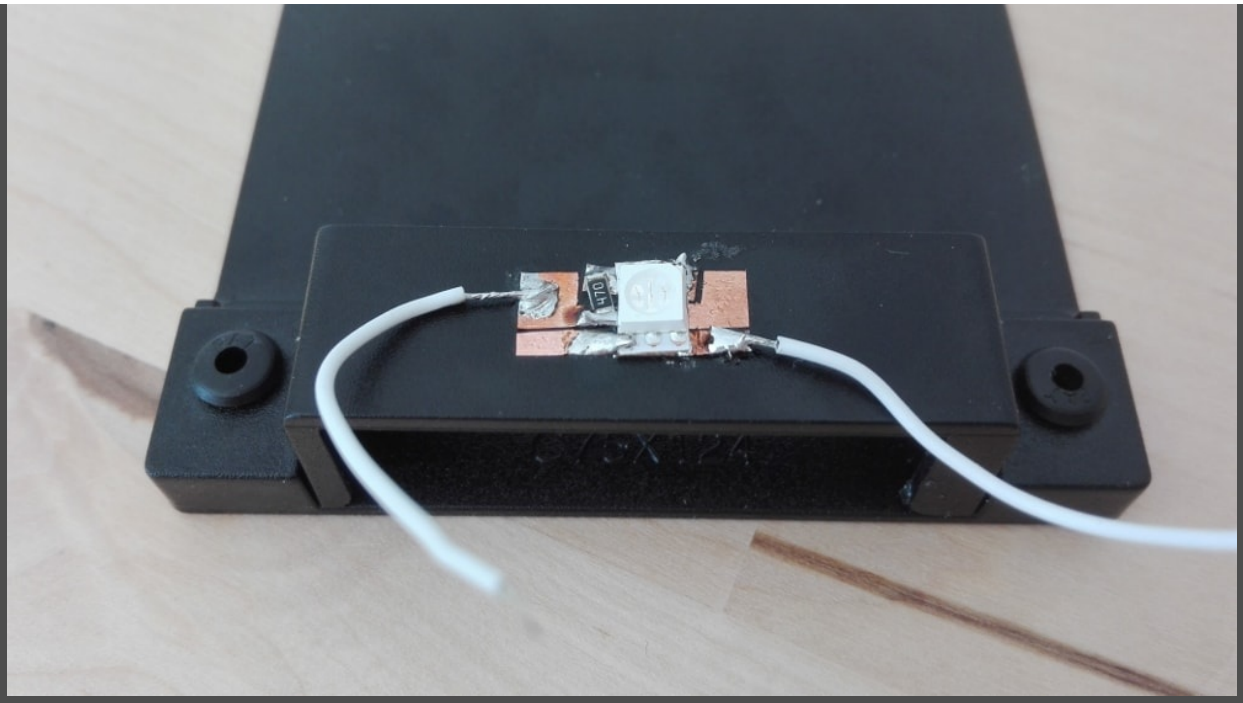
In the next step I cut a piece of copper tape. It was easy to sense that this was slowly reaching its limits. In some places, the copper tape already wanted to detach itself from the carrier material and roll up again. So it is apparently not possible to cut even finer strips by hand. With a plotter this is already much too small and I have to see what technical procedure I want to develop to solve this problem. I ask myself how far I can reduce the size of a copper tape pcb.





The gluing didn't cause any problems and works very well as in the previous tests. To press the copper band even tighter against the plastic I squeezed out small air bubbles with a cotton swab. This can significantly improve the quality of the print.

In the last step of the process, I soldered the components to the adhesive tape, and I noticed a few things. Plastic is not suitable as a substrate for a circuit board. I ask myself whether this can be handled with a different soldering technique, because I want to use plastic as a carrier material for scientific interests. Too much solder can bend the copper strip. After connecting a battery the LED was also lit, but unfortunately too short to take a picture. Apparently I had used a technical error somewhere or by mistake a too strong button cell battery. But since it worked and the test is only an intermediate step, I didn't look for the error. *It is possible to cut, glue and solder a small copper tape PCB*. Now I have to see if there's any other way I can solder.



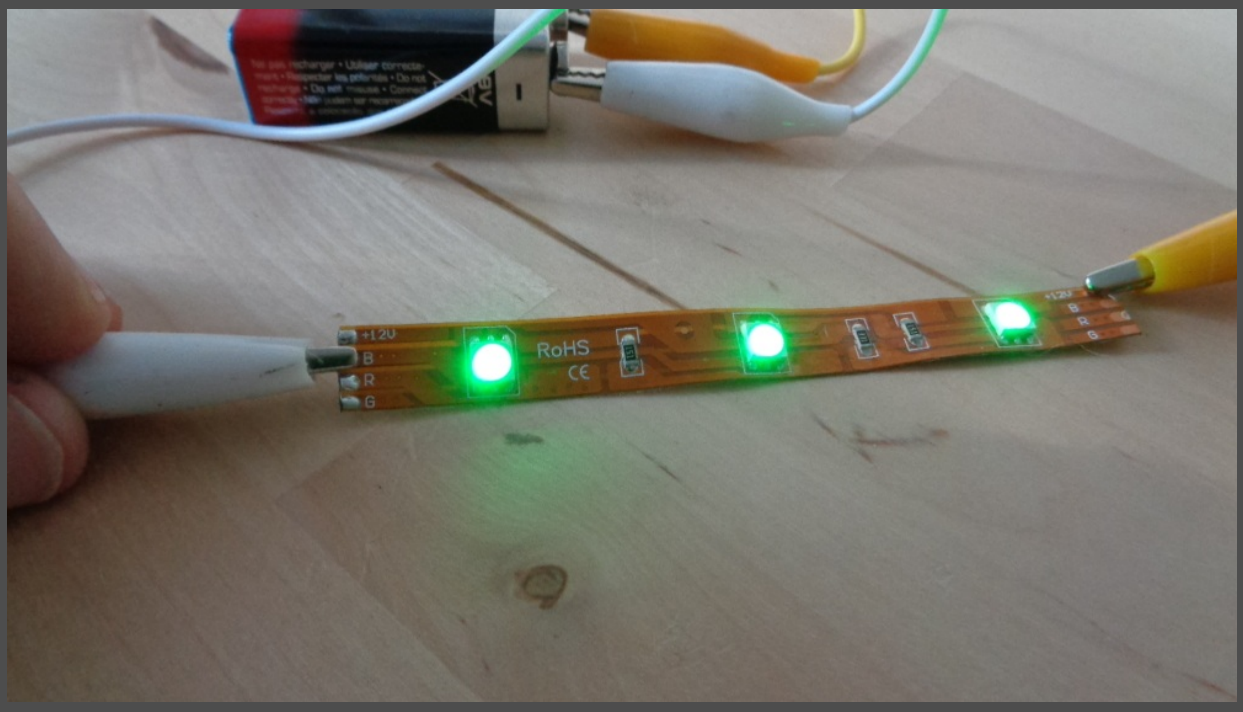
Roland CX-24 vinyl cutter test

During all the experiments in the last weeks, I asked myself if I could cut the copper foil tape with a vinyl cutter. So I finished a package and just mailed a roll to my brother. Since my brother is also self-employed and mainly works on orders for film plotting, he has a Roland CX-24 vinyl cutter in the basement. As he told me in the letter, he made some attempts, but all of them did not work. It wasn't the size, it was the tape. He didn't want to break his knives now, because they are quite expensive. Nevertheless, I expected a different result. Interesting that this is apparently not so easy to cut with a machine.

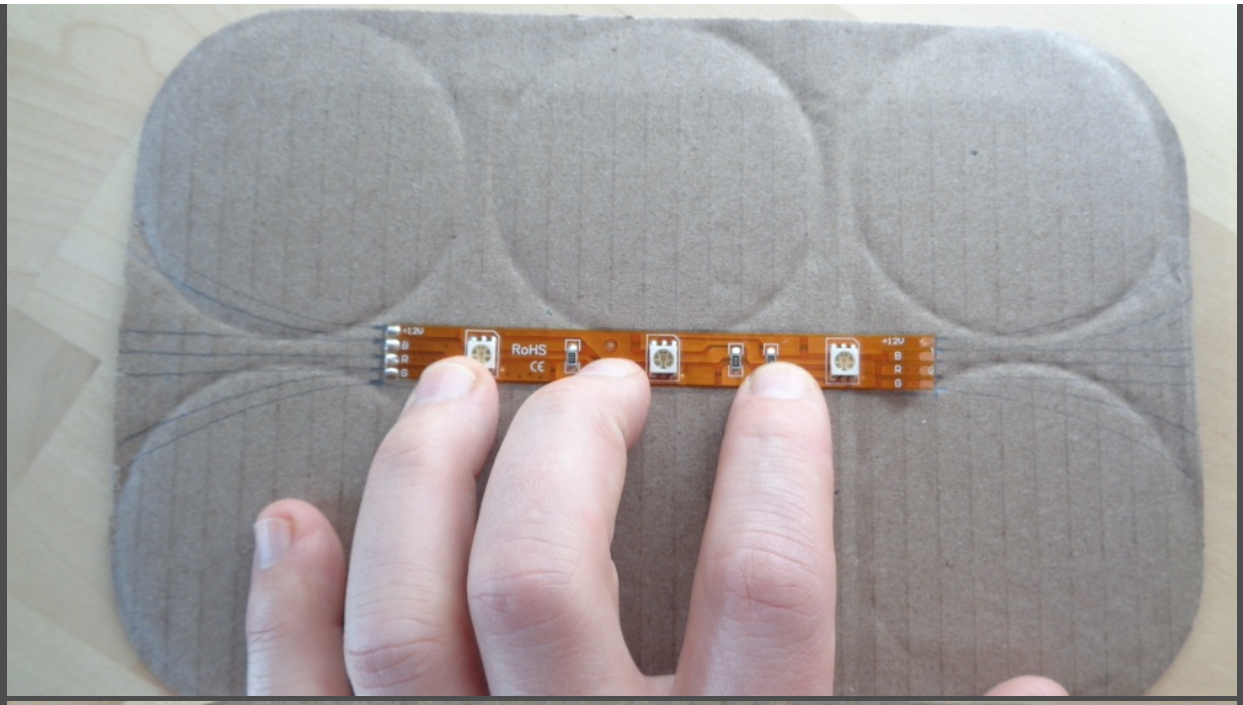
A Cardboard PCB

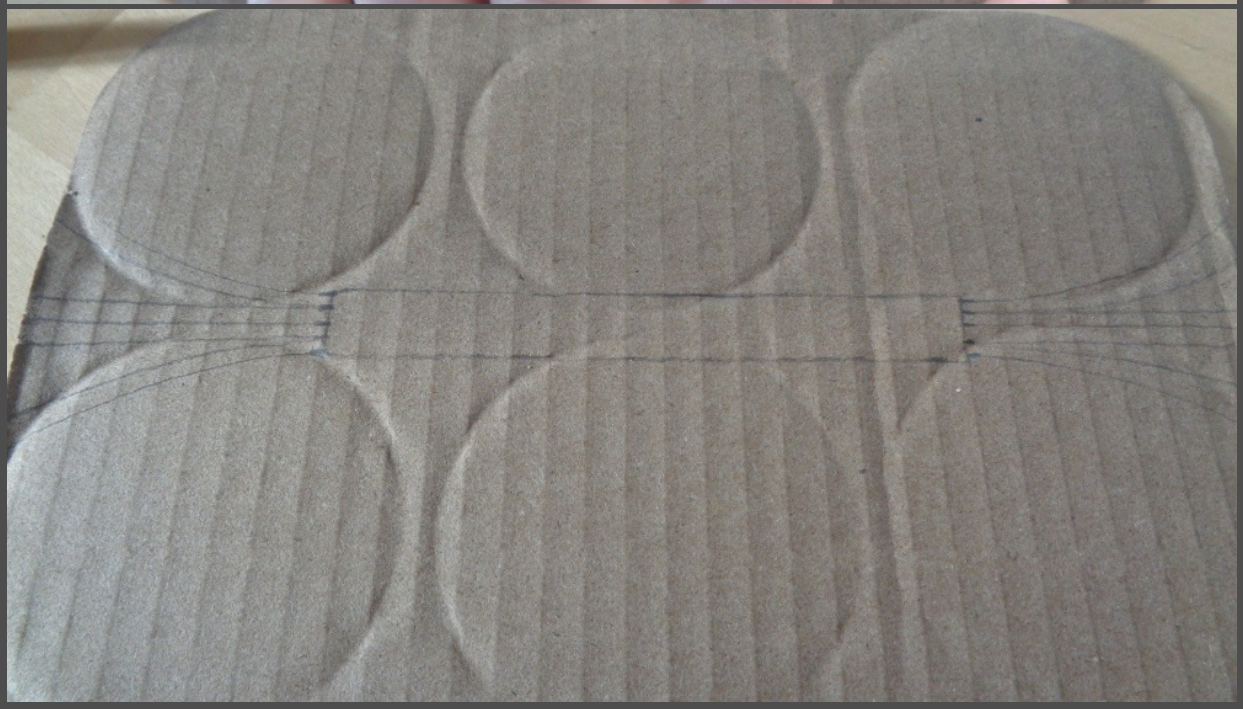
In the last few months I have watched some videos on the subject of technology and have been inspired by the following test. The Strange Parts video shows (Strange Parts, How I Made My Own RFID tag - From Shenzhen, China to New York City, Oct 24, 2018, 42:07 min.) how to glue copper foil onto cardboard and use it as an improvised PCB. I didn't own any of the machines shown in the report, but it should be easy to do that. As a template I used a small piece of an LED tape, which I still have from an old project.

Before we start working, we test if the led strip works. We use two crocodile clips and a 6V block battery. We clamp these at the different ends. I have no idea why the LED is green even though it is marked blue.

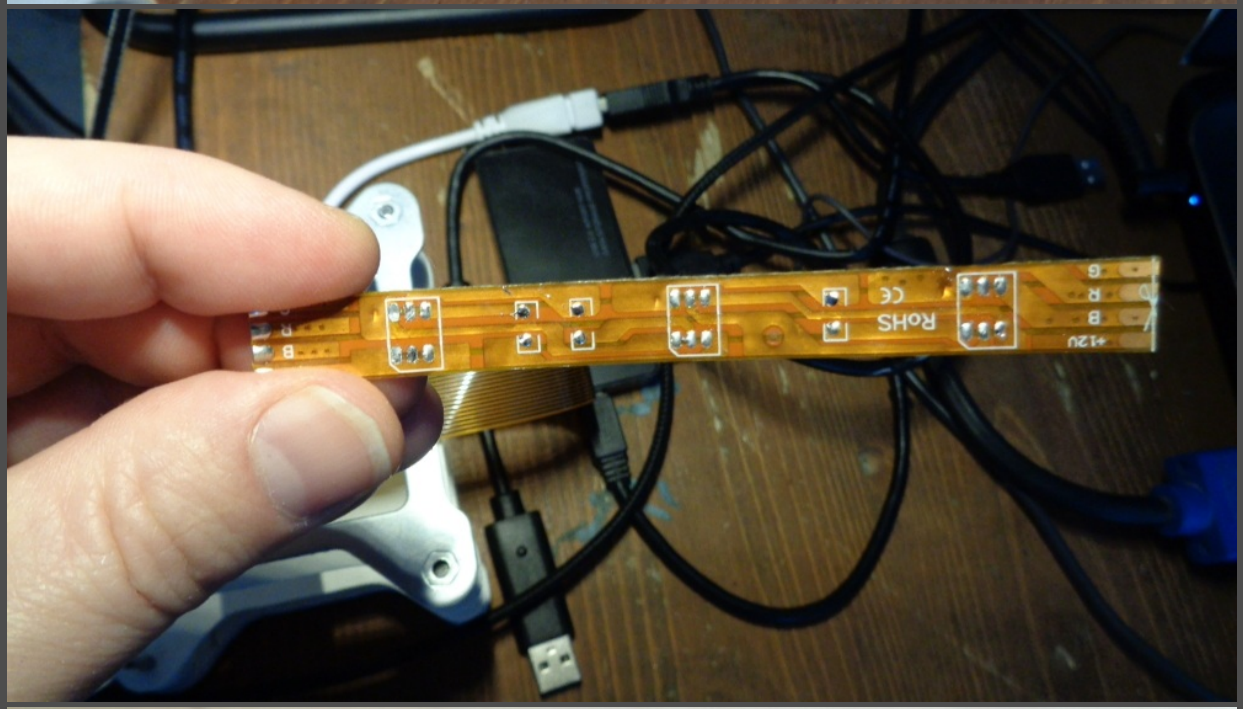


So that we know where to stick the tracks after they have been drawn, we draw the outlines with a pencil. This can only be done roughly, because everything will not shift a little anyway.



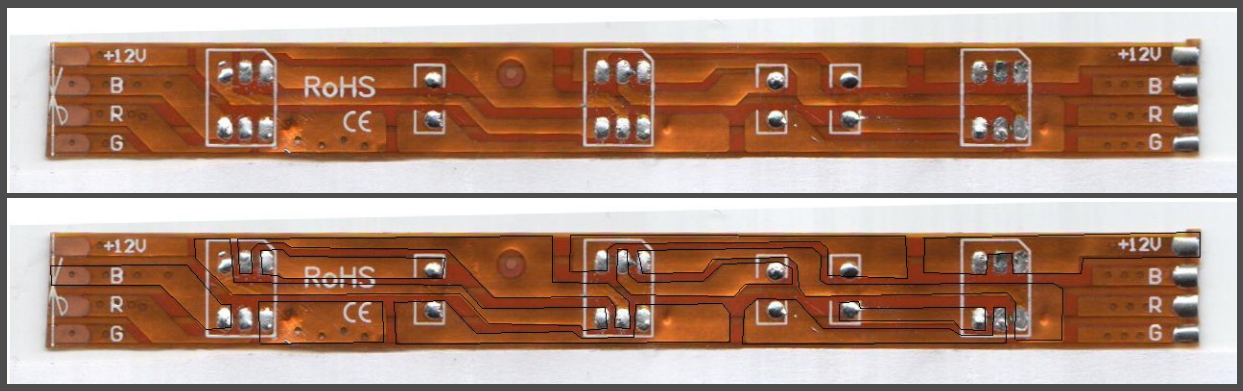


Now the components are removed from the led tape. we do this with a heat gun, as I already described in another article. We keep the parts and put them in a small plastic box. Maybe I will use it again. So that we don't burn our fingers we stick the led tape with masking tape on our desk. We remove the components with a pair of tweezers because I heat them up. At work we should wear safety glasses so that we don't get anything in our eyes.

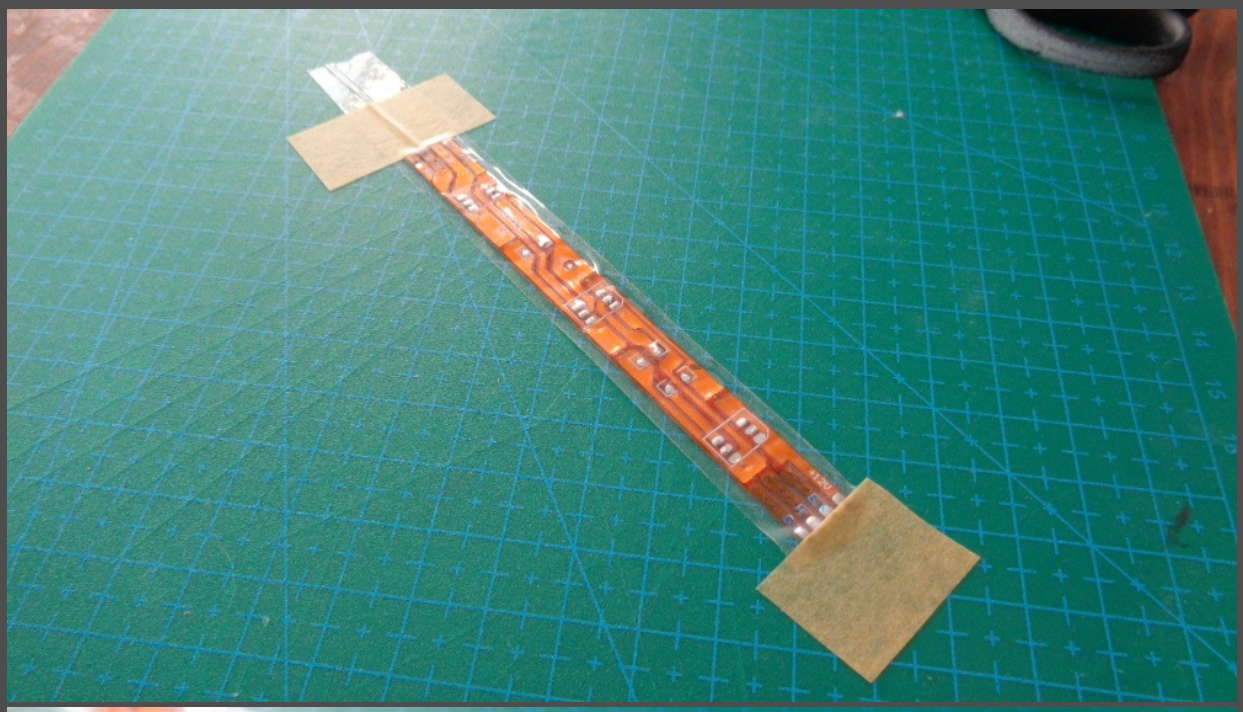


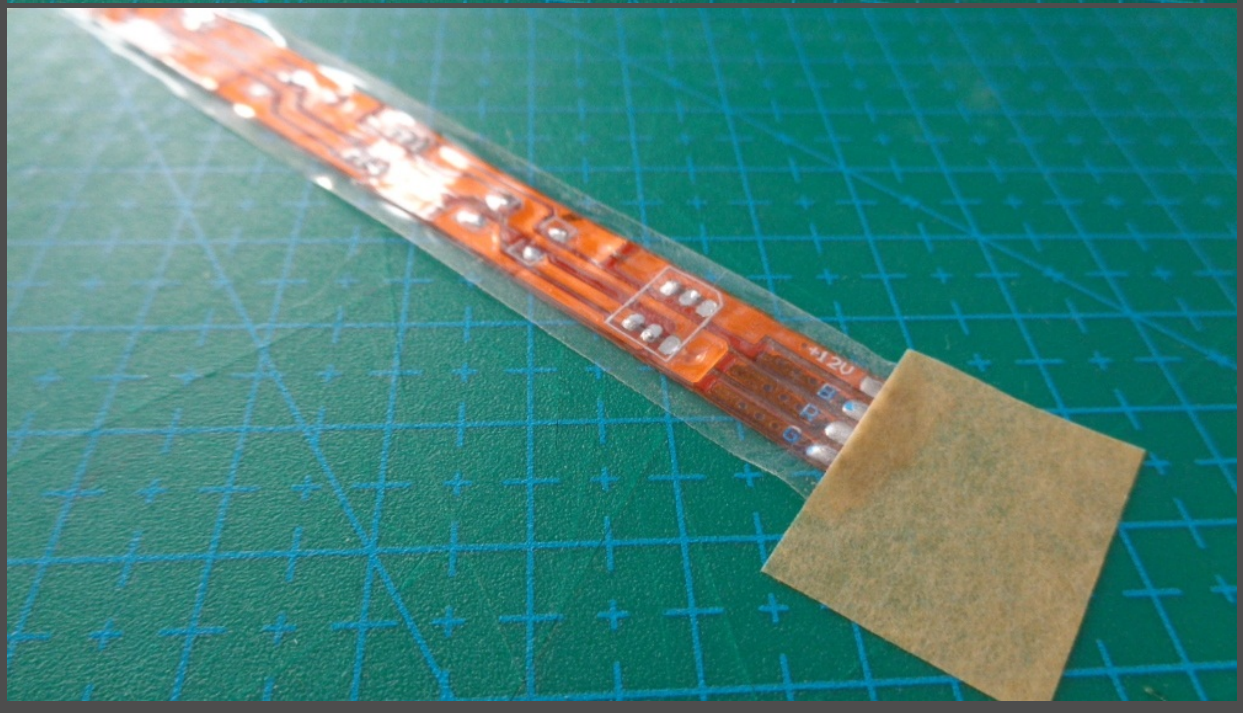
At this point I actually intended to scan the led tape, rebuild it in Inkscape and print it out as a template. Unfortunately the Windows computer crashed with the printer and I didn't want to fix the

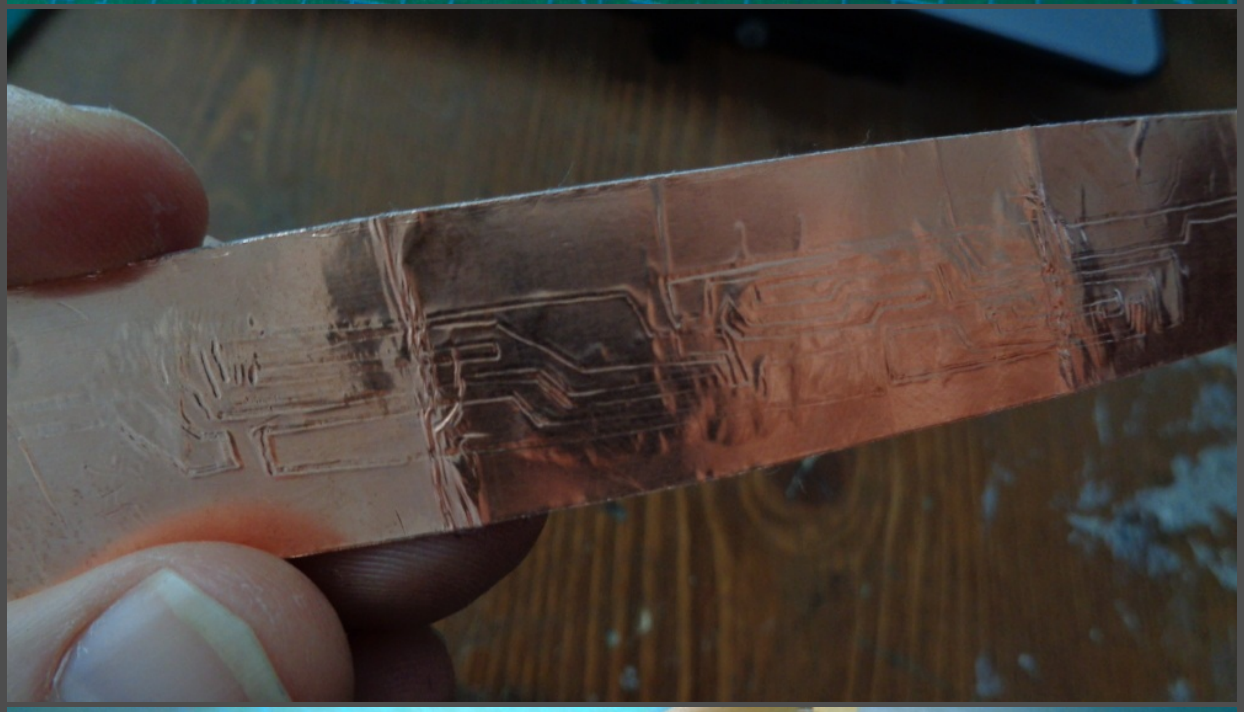
problem. So I copied it with a very inaccurate technique, some tape and waterproof pens. This also worked, but it's very rough in the display. I still post the image files here. I edited the lower one with Gimp, so you can see which tracks I used.

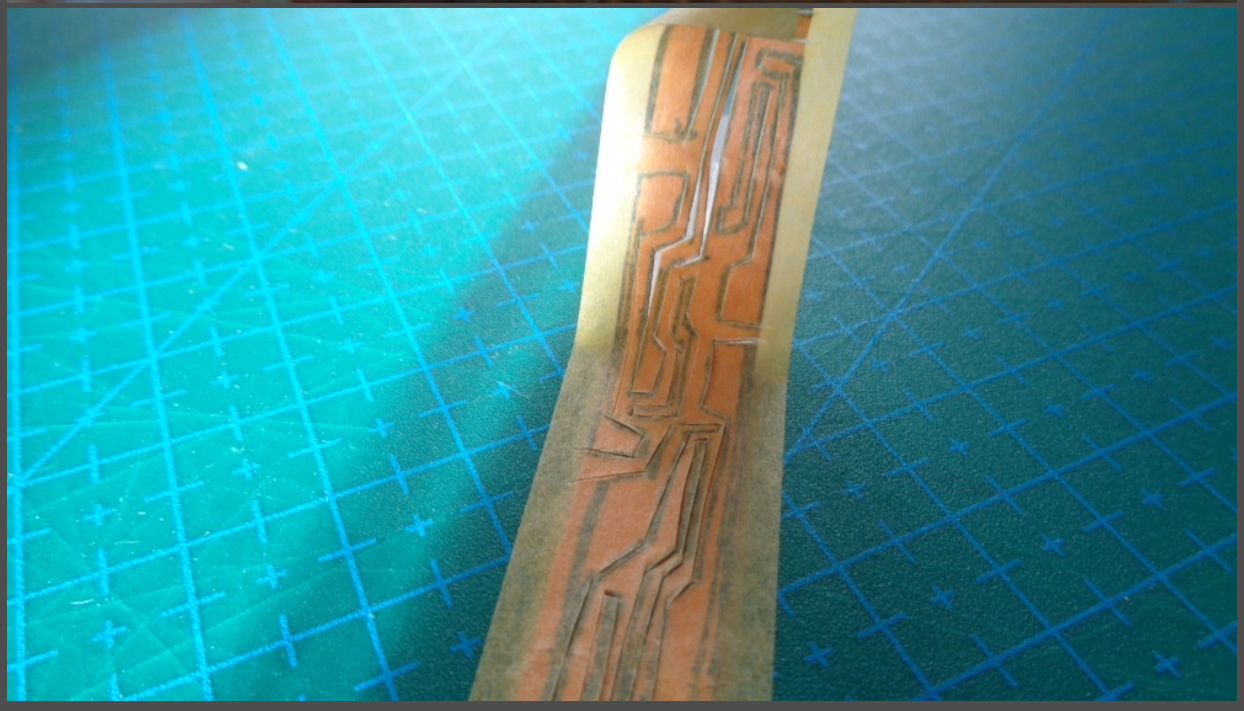


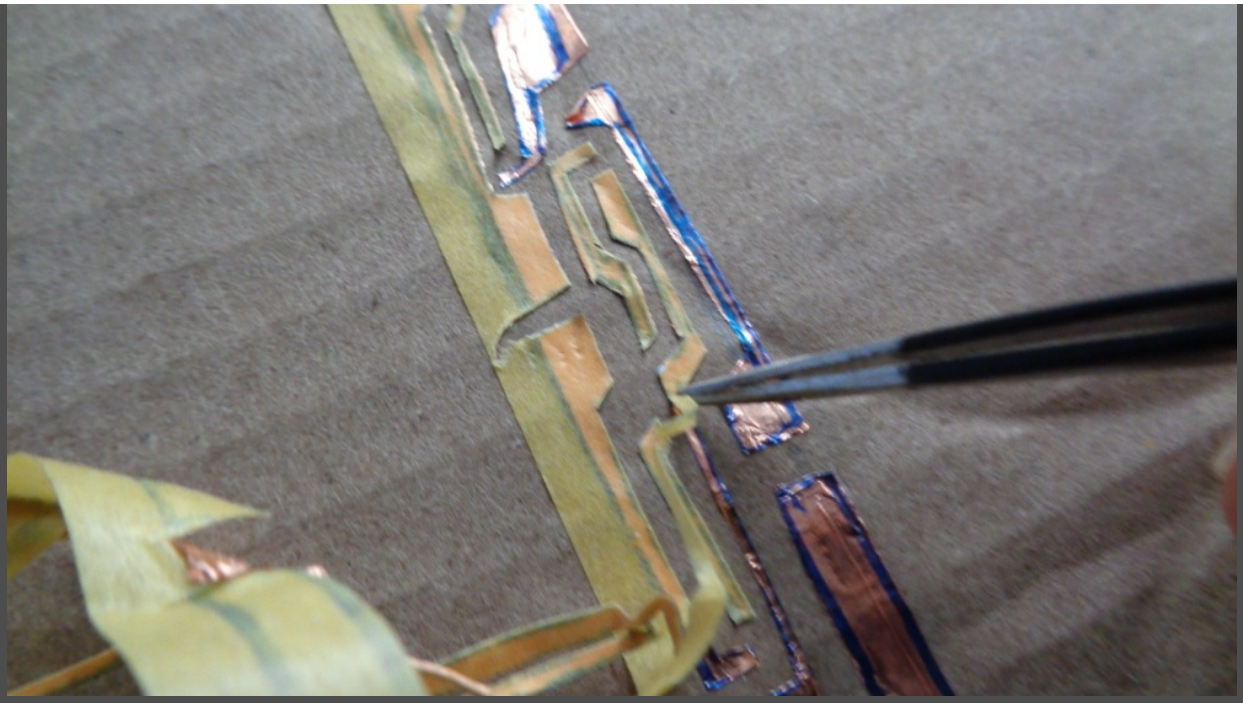
So that I can copy the tracks, I stuck transparent tape on the led tape and attached it with two small strips of masking tape on a base. Then I copied it with a blue pen and cut it out with a precision knife. At the end everything lived on the cardboard and with tweezers carefully removed the remains.











As I said above, the result is modest, but it works. I removed the remains of the blue pencil with nail polish remover to make it look better. In the future I want to test how well you can fix the components on the cardboard pcb. But first I have to rework the USB microscope project, because the components are really small. But I got new ideas through the attempt and cardboard is apparently not a bad material to make a prototype pcb.